Prevalence of Temporomandibular Disorders in an Adult Brazilian Community Population Using the Research Diagnostic Criteria (Axes I and II) for Temporomandibular Disorders (The Maringá Study)

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Purpose: The primary objective of this study was to assess the prevalence of temporomandibular disorders (TMDs) and comorbid factors (sleep bruxism and headaches). This study was a cross-sectional population survey in the city of Maringá, state of Paraná, Brazil. **Materials and Methods:** Axes I and II of the Research Diagnostic Criteria for TMD (RDC/TMD) were used for assessment of TMD signs and symptoms. The population was users of the Brazilian public health system (SUS), of both sexes, between the ages of 20 and 65 years, and not seeking treatment for TMD. **Results:** The selected population (N = 1,643) was composed mostly of *(a)* women (65.9%), *(b)* married or single individuals (90.6%), *(c)* Caucasians (70.1%), *(d)* individuals aged 32.7 ± 10.3 years, *(e)* individuals earning a medium income (75.1%), and *(f)* those who had completed a high school education or higher (79.9%). According to the chronic pain grade classification (CPG) in the RDC/TMD Axis II, 36.2% of the population had some degree of TMD pain (CPG I to IV); however, only 5.1% had severe limitation due to pain (CPG III or IV). In the RDC/TMD Axis I diagnoses, 29.5% presented with muscle disorders (group I), 7.9% with disk displacements (group II), and 39.1% with other joint disorders (group III). Headaches were present in 67.9% and awake and sleep bruxism in 30% and 33.4% of the population, respectively. **Conclusion:** The prevalence of signs and symptoms of TMD was high in this population, but with low disability; however, the proportion of patients in need of treatment was much lower. *Int J Prosthodont 2015;28:600–609. doi: 10.11607/ijp.4026*

According to the American Academy of Orofacial Pain, the field of orofacial pain addresses pain conditions that are associated with the hard and soft tissues of the head, face, and neck, and all of the intraoral structures, including headaches, musculoskeletal pains, neurogenic pains, psychogenic pains, and pains from major diseases.[1] Temporomandibular disorders (TMDs) are a subset of orofacial pain conditions characterized by spontaneous pain emanating from the masticatory muscles and/or the temporomandibular joints (TMJs).[2] To standardize the TMD examination protocol, as well as to provide a thorough assessment of all factors involved in the experience of pain, a dual-axis system evaluating the physical diagnosis of masticatory muscles and TMJs (Axis I) as well as the patient's pain disability and psychosocial/behavioral correlates (Axis II) was developed in the early 1990s.[3] The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) has been tested for reliability and validity for both Axes I and II with good to excellent results, particularly when recalibrated examiners have been used, even when compared to magnetic resonance imaging (MRI) as the gold standard for TMJ disc displacement.[4–11]

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The RDC/TMD has been translated and validated in many different languages, including Brazilian Portuguese, to assess the prevalence of TMD from a global perspective.[12–20] Nevertheless, the prevalence of TMD at the population level is still questionable due to the employment of different methodologies. Few community-based TMD studies have actually used the RDC/TMD, and even when it has been used, only Axis I has been employed.[21] In a recent systematic review of prevalence studies about TMD, it was found that only 21 papers including community and patient populations have been published using the RDC/TMD, and only 6 of the 21 were actually population studies. In this review, the prevalence of TMD diagnoses in adult populations varied from 30.1% to 45.3% in TMD patients and from 14% to 32.1% in community populations, depending on whether patients were affected by a muscle disorder (group I), a disk interference disorder (group II), other joint disorders (group III), or a combination thereof.[21] This review also demonstrated that prevalence studies based on TMD patient populations have been overestimated due to the higher prevalence found in this group compared to that in community populations.

In Brazil, both adult TMD patient population studies using the RDC/TMD and community population studies that have not used the RDC/TMD are available.[22–28] In the adult TMD patient population, 95.7% reported pain in the last 6 months, with 75% of patients having recurrent pain for the last 7 years, and 82.9% were diagnosed as group I, 30% as group II, and 64.3% as group III disorders.[22] In community samples, 39.2% had at least one TMD symptom, and spontaneous pain emanating from the TMJ was present in 25.6% of subjects.[23] The remaining Brazilian studies have measured the prevalence, associations, and pain thresholds of chronic orofacial pains in general, including headaches, idiopathic orofacial pain, trigeminal neuralgia, burning mouth syndrome, and fibromyalgia, but they have not been specific to TMD.[24–28]

The objective of this study was to assess the prevalence of TMDs in a community-based non-TMD population registered in the Brazilian public health system (SUS) in the city of Maringá, using the RDC/TMD Axes I and II. To this end, we assessed the prevalence of RDC/TMD Axis I diagnoses, such as muscle and TMJ disorders (groups I, II, and III). In addition, we verified the prevalence of the chronic pain grade (CPG) scale of RDC/TMD Axis II (pain intensity and disability) to determine the impact of TMD pain in the patients' lives and to verify which TMD patients actually require specialized treatment. Finally, we assessed the prevalence of two common TMD comorbid factors, sleep bruxism and headaches, included in RDC/TMD Axis II. A correlational study on the association of TMD pain with different risk factors will be submitted later due to the very large database, but the complete methodology will be described in both publications.

Materials and Methods

The present study was approved by the Ethics Committee of the Ingá Faculty of Dentistry (No. 0071/11), by the Ethics Committee of the Secretary of Health of the City of Maringá, and by the Ethics Committee of the São Lucas Hospital, Pontifical Catholic University of Rio Grande do Sul (CEP/HSL/PUCRS, Plataforma Brasil No. 70988). Patients were free to participate or not participate in the study, and all participants were required to sign the approved consent form.

Population, Inclusion/Exclusion Criteria, and Research Design

This study was a population survey (cross-sectional study) in the city of Maringá (325,968 inhabitants), state of Paraná, Brazil. Data were collected between August 2011 and March 2012. The selected population was composed of individuals of both sexes between the ages of 20 and 65 who were registered users of SUS in the city of Maringá. According to data provided by the Maringá Secretary of Health, 132,620 subjects were within this age range. Considering that only the Maringá public health database was used due to its reliable patient records and that patients were users of Basic Health Units (UBS) and not chronic pain patients from hospitals, our study was a community-based study in which a similar methodology to one previously described in the literature was implemented.[29]

The list of elected individuals was obtained from the Maringá Secretary of Health. From this list, subjects were selected proportionally based on the number of users in each UBS. Thus, if a UBS had 10% of the total number of registered users, 10% of the calculated final sample size would be randomly selected by a computer program (SPSS, IBM) from this unit to prevent selection biases.[30] Patients were then contacted by phone about their willingness to participate. If a patient agreed to participate, he/she was asked to come to the TMD clinic at the Ingá Faculty of Dentistry to sign a consent form, provide patient history, and undergo clinical examination. Eligible subjects were excluded from our sample if they reported acute periodontal disease, pain due to caries, or periapical pathologies; if they were using anti-inflammatory drugs (other than paracetamol), anxiolytics, anticonvulsants, and/or opioids; or if they had

systemic and/or psychological diseases or disorders that might have influenced the clinical examination or the diagnosis of TMD. In cases in which acute caries or periapical pathologies were reported, patients were clinically examined for confirmation and referred to the appropriate treatment facility in the Ingá Faculty of Dentistry.

Research Questionnaires

For data collection, structured, tested, and validated questionnaires were used to assess socioeconomic, demographic, behavioral, psychosocial, TMD pain–related, and sleep-related variables. For assessment of TMD, Axes I and II of the Brazilian Portuguese version of the RDC/TMD were used (http://www.rdc-tmdinternational.org/TMDAssessmentDiagnosis/RDC-TMD/Translations/Portuguese(Brazil).aspx). The Brazilian Portuguese RDC/TMD has been tested for reproducibility (α = .72) and validity (kappa values from 0.73 to 0.91).[31] Axis II was used to assess behavioral, psychosocial, and quality-of-life aspects related to TMD pain diagnosis and treatment. This axis includes a CPG scale, a characteristic pain intensity (CPI) scale, a pain disability scale, and a depression/somatization scale based on the Symptom Checklist-90-Revised (SCL-90R). Axis I is based on a careful clinical examination of traditional signs and symptoms of TMD and a structured diagnosis of the most common articular and/or muscular disorders affecting the TMJs and/or masticatory muscles.[3]

MRI was not used because of its questionable cost-benefit ratio due to low spatial resolution and problems in the diagnostic reproducibility of images, allowing only pronounced disc alterations in form and position to be observed.[32,33] In addition, RDC/TMD diagnoses for TMJ internal derangements have been compared against MRI diagnoses, with good results obtained for disk displacement (DD) with reduction (kappa = 0.69), acceptable results for DD without reduction (0.57), and good results for normal disk-condyle relationship (0.61). MRI without clinical symptoms tends to overdiagnose DD with and without reduction.[34] Another problem with MRI is the low to good interobserver agreement (kappa = 0.3 to 0.7) among TMD specialists and radiologists for all TMJ pathological conditions, including degenerative alterations of the condyle, degenerative alterations of the mandibular fossa, alterations in the morphology of the TMJ disk, disk displacement with reduction, disk displacement without reduction, TMJ effusion, and TMJ hypermobility.[35,36] We were unable to use panoramic radiographs and computed tomography images for ethical reasons, considering that ours was a non-TMD population.

Clinical Examination

Prior to the initial examination, a pilot study with 20 interviews and clinical examinations was performed on selected active users of the Maringá SUS to assess the overall duration of the examination and anticipation of difficulties in the field work. A quality control assessment with 10% (random selection) of our total sample was performed by phone interview with a simplified version of RDC/TMD Axis II, using selected variables that do not fluctuate over time (questions 23 to 29). This assessment was carried out to verify whether the results collected remained stable over time, confirming the accuracy of our results, which is recommended in large samples.[37] The study was conducted in the following manner. First, the consent form was read and signed by each patient. Then, the patient's clinical history was recorded and an examination performed using the RDC/TMD Axes II and I, respectively. The clinical examination was carried out by a single trained, experienced clinical examiner according to the RDC/TMD consortium guidelines, including the RDC/TMD video (http://www.rdc-tmdinternational.org/TMDAssessmentDiagnosis/RDC-TMD/Translations/Portuguese(Brazil).aspx). The examiner was blinded to the self-completing questionnaires completed by patients and was asked not to question the patients regarding TMD or related variables assessed in the questionnaires. The person in charge of loading the data and creating the database was blinded to the patients' identification.

Sample Size Calculation and Statistical Analysis

For the prevalence study, the sample size required to estimate the prevalence of TMD and associated factors was based on the total percentage of registered and active users in the Maringá SUS between the ages of 20 and 65 according to the Maringá Secretary of Health (132,620 subjects). This figure was used to prevent the inclusion of those with duplicate registrations, those who moved out of the city, and those who passed away. To estimate the prevalence of TMD, the following parameters were used: *(a)* 95% confidence interval (CI), *(b)* anticipated TMD prevalence of 5% in the population, and *(c)* 1.5% absolute precision (margin of error). These parameters yielded a partial sample size of 806 individuals for the prevalence part of the study. For the correlational part of the study, which will be reported in our next publication, using a 5% prevalence in the nonexposed group, 10% prevalence in the exposed group, an 8:1 exposed/nonexposed ratio, and a statistical power of 80% to detect a risk ratio equal to 2 with a 95% CI, a sample size of 1,365 individuals was estimated. Another 30% was added

to compensate for losses in recruitment and missing values, yielding a final sample size of 1,775 individuals.[30,38] Data analysis was conducted using the SPSS 18.0 (IBM) and Stata 11.0 (StataCorp) programs.

Results

The final data collection featured 1,643 patients due to the very high recruitment rate (92.56%) and very low number of missing values, which far exceeded our initial sample size calculation (1,365). Losses in recruitment (n = 132) were due to the following: *(a)* 51 were not found, *(b)* 32 were users of chronic medication, *(c)* 19 had relocated, *(d)* 17 refused to participate, *(e)* 10 were hospitalized, *(f)* 2 had a criminal record, and *(g)* 1 had passed away. The patients were predominantly women (65.9%), young adults (84.7%) between the ages of 20 and 49 years (32.7 ± 10.3), married or single individuals (90.6%), Caucasians (70.1%), those with a Brazilian medium income (75.1%), and those who had completed high school education or higher (79.9%). This distribution is comparable to that provided by the Brazilian Institute of Geography and Statistics (IBGE) on the city of Maringá, confirming that our sample was representative of the population.

According to the CPG of RDC/TMD Axis II shown in Table 1, 36.2% of the population felt some degree of TMD pain, regardless of intensity or limitations due to pain (CPG I, II, III, and IV). This figure was reduced to 17.8% when only those subjects with high-intensity pain and those with low to severe limitations due to pain (CPG II, III, and IV) were considered. However, only 5.1% of individuals in the population presented with moderate to severe limitations due to TMD pain (CPG III and IV) and require specialized treatment. Among these patients with moderate to severe limitations due to pain, only a few have lost two or more days of work. The pain in this group of patients showed moderate intensity levels, a chronic nature, and a recurrent pattern and was located predominantly either in the masticatory muscles or in both the masticatory muscles and the TMJs.

The results of the clinical examination, shown in Table 2, indicate the RDC/TMD group diagnoses (groups I, II, and III) evaluated by Axis I. Myofascial pain with or without limitation of opening (groups Ia and Ib) was the most prevalent and was found in 29.5% of the population. Disk displacement with reduction (group IIa) on the right, left, or both TMJs was found in 6.5% of the population; however, only 2.2% of patients had associated pain and are in need of treatment. Disk displacement without reduction (groups IIb and IIc) was quite rare (1.4%), and both groups were unilateral, with no limitation of movement and no pain. Arthralgia (group IIIa) on the right, left, or both TMJs was also very common and was present in 21.7% of the community sample. However, only 5.1% of subjects were diagnosed with osteoarthritis (group IIIb) and are in need of treatment. Osteoarthrosis (group IIIc) on the right, left, or both TMJs was not uncommon and was found in 12.3% of subjects, but they were pain-free.

The results of this study also show that isolated TMD signs assessed by the Axis I of the RDC/TMD are common in the general population and were not

Table 1 Prevalence of the RDC/TMD Axis II for TMD Pain Classification, Disability, Intensity, and Location in a Sample Extracted from the Population of City of Maringá Users of the Brazilian Public Health System (N = 1,643)

Variable	n	%
CPG classification (%)		
Grade 0 = no pain in the last 6 months	1,048	63.8
Grade I = low intensity	303	18.4
Grade II = high intensity	208	12.7
Grade III = moderately limiting	72	4.4
Grade IV = severely limiting	12	0.7
Disability points (%)	(n = 595)*	
No disability = 0 points	359	60.3
Mild = 1 to 2 points	99	16.6
Moderate = 3 to 4 points	79	13.3
Severe = 5 to 6 points	58	9.7
Disability days (%)	(n = 595)*	
0	509	85.5
1	62	10.4
2	20	3.4
≥ 3	4	0.7
CPI (scores from 0 to 100) (mean [SD])	595*	48.01 (24.36)
Temporal distribution of pain (%)	(n = 594)*	
Persistent	47	7.9
Recurrent	450	75.8
Only one time	97	16.3
How long has your facial pain been present (years)? (Mean [SD])	595*	5.95 (6.11)
Site of spontaneous pain (right side) (%)	(n = 1,642)	
No pain	1,170	71.3
Joint pain	145	8.8
Muscle pain	166	10.1
Both joint/muscle pain	161	9.8
Site of spontaneous pain (left side) (%)		
No pain	1,168	71.1
Joint pain	144	8.8
Muscle pain	162	9.9
Both joint/muscle pain	169	10.3

*Only subjects with CPG classification I to IV were included in the analysis.
CPG = chronic pain grade; CPI = characteristic pain intensity.

Table 2 Prevalence of the RDC/TMD Axis I, Including Groups with and without Spontaneous Pain, in a Sample Extracted from the Population of City of Maringá Users of the Brazilian Public Health System (N = 1,643)

Variable	n	%
Muscle disorders		
No pain	1,159	70.5
Myofascial pain	312	19.0
Myofascial pain with limited opening	172	10.5
Disk displacement with reduction		
Absent	1,536	93.5
Present, right or left TMJ	73	4.4
Present, right and left TMJs	34	2.1
Disk displacement with reduction with pain		
Absent	1,607	97.8
Present, right or left TMJ	22	1.3
Present, right and left TMJs	14	0.9
Disk displacement without reduction		
Absent	1,620	98.6
Present, right or left TMJ	23	1.4
Present, right and left TMJs	0	0.0
Arthralgia		
Absent	1,287	78.3
Present, right or left TMJ	93	5.7
Present, right and left TMJs	263	16.0
Osteoarthritis		
Absent	1,558	94.8
Present, right or left TMJ	32	1.9
Present, right and left TMJs	53	3.2
Osteoarthrosis		
Absent	1,442	87.8
Present, right or left TMJ	85	5.2
Present, right and left TMJs	116	7.1

included in our tables because they had already been used for the Axis I diagnosis shown in Table 2; thus, the information gathered regarding isolated TMD signs will be reported only in this paragraph to avoid redundant information. TMJ sounds, such as clicking, were found in 9.9% to 21% of subjects, depending on whether the sounds emanated from the right or left side or whether they occurred on opening or closing. Course and fine crepitations were observed in 8.8 to 10.6% of subjects, also depending on the side and the path of movement. One interesting finding is that clicking not only varied substantially between the right and left sides but also between opening and closing mandibular movements. Similarly, crepitation varied betwen the right and left sides, but it did not vary according to the path of mandibular movement. Thus, if crepitation is present on opening, it will most likely be present on closing (reciprocal).

Table 3 Prevalence of TMJ Disc Displacement, Arthralgia, and Osteoarthrosis/Osteoarthritis Problems Using the RDC/TMD Axis II in a Sample Extracted from the Population of City of Maringá Users of the Brazilian Public Health System (N = 1,643)

Variable	n	%
Have you ever had your jaw lock or catch so that it won't open all the way?	(n = 1,642)	
No	1,480	90.1
Yes	162	9.9
Was this limitation in jaw opening severe enough to interfere with your ability to eat?	(n = 1,332)	
No	1,250	93.8
Yes	82	6.2
Does your jaw click or pop when you open or close your mouth or when chewing?		
No	1,149	69.9
Yes	494	30.1
Does your jaw make a grating or grinding noise when it opens and closes or when chewing?		
No	1,325	80.6
Yes	318	19.4
Does your jaw ache or feel stiff when you wake up in the morning?		
No	1,227	74.7
Yes	416	25.3
Do you have noises or ringing in your ears?		
No	1,220	74.3
Yes	423	25.7
Does your bite feel uncomfortable or unusual?		
No	1,213	73.8
Yes	430	26.2
Do you have rheumatoid arthritis, lupus, or other systemic arthritic disease?		
No	1,528	93.0
Yes	115	7.0
Do you know of anyone in your family who has had any of these diseases?		
No	1,257	76.5
Yes	386	23.5
Have you had or do you have any swollen or painful joint(s) other than the joints close to your ears (TMJ)?		
No	1,353	82.3
Yes	290	17.7
If yes, is this a persistent pain that you have had for at least one year?	(n = 290)	
No	131	45.2
Yes	159	54.8

Table 3 shows that the TMJ symptoms reported by patients assessed by RDC/TMD Axis II for disk displacement are also common in the general population and with higher prevalence than the isolated TMJ signs detected by the examiner described above. The TMD symptoms were also much higher than in the RDC/TMD group II and III diagnoses assessed by

Axis I (Table 2). Disk displacement associated with TMJ-related symptoms, such as locking, limitation in jaw opening, clicking, or popping, were reported by approximately 30% of the population studied. Similarly, TMJ osteoarthritis/osteoarthrosis-related symptoms (eg, TMJ grating or grinding noises, uncomfortable bite due to occlusal alterations resulting from TMJ inflammation and resorption, and family history of degenerative joint diseases) were reported by almost 30% of the subjects interviewed. Only swollen and/or stiff joints other than the TMJs had a similar prevalence (17.7%) to individual signs (8.8% to 10.6%) and group diagnoses of osteoarthritis/osteoarthrosis (groups IIIb + IIIc = 17.4%). However, only slightly over half of those reporting swollen and/or stiff joints (9.7%) had persistent pain due to the problem and must be referred to a rheumatologist.

Among the possible comorbid conditions of TMD assessed by RDC/TMD Axis II, sleep and awake bruxism were common and were found in approximately one-third of the population (Table 4). In addition to sleep/awake bruxism, other TMD comorbid conditions not assessed in RDC/TMD Axis II were fibromyalgia, chronic fatigue syndrome, and irritable bowel syndrome.[24–27,39–41] A history of injury (trauma) to the face or jaw was found in a small number of individuals, but the majority of those patients did not experience pain before the injury and only 2.57% of the population reported pain after the injury. Concurrent migraines/headaches were found in more than two-thirds of patients, making this symptom even more prevalent than TMD itself. The majority of patients also reported taking good or very good care of their general and oral health.

Among the limitations in daily activities caused by TMD found in the population studied, only chewing, eating hard foods, and yawning showed modest prevalences, ranging from 14.5% to 19.5%. For all other variables (eg, drinking, exercising, eating soft foods, smiling/laughing, sexual activity, cleaning teeth or face, swallowing, talking, or having one's usual facial appearance), the limitations were observed only in a small number of the population studied, ranging from 2.6% to 8%, and due to the low relevance of these findings, a corresponding table is not displayed.

Table 4 Prevalence of Sleep and Awake Bruxism, Trauma to the Face or Jaw, and Headaches Using the RDC/TMD Axis II in a Sample Extracted from the Population of City of Maringá Users of the Brazilian Public Health System (N = 1,643)

Variable	n	%
Have you been told or noticed that you grind your teeth or clench your jaw while sleeping at night?		
No	1,095	66.6
Yes	548	33.4
During the day, do you grind your teeth or clench your jaw?		
No	1,150	70.0
Yes	493	30.0
Have you had a recent injury to your face or jaw?		
No	1,570	95.6
Yes	73	4.4
If yes, did you have jaw pain before the injury?	(n = 82)	
No	48	58.5
Yes	34	41.5
During the last 6 months have you had a problem with headaches or migraines?		
No	527	32.1
Yes	1,116	67.9
How good a job do you feel you are doing in taking care of your health overall?		
Excellent	96	5.8
Very good	319	19.4
Good	734	44.7
Fair	294	17.9
Poor	200	12.2
How good a job do you feel you are doing in taking care of your oral health?		
Excellent	125	7.6
Very good	378	23.0
Good	662	40.3
Fair	280	17.0
Poor	198	12.1

Discussion

The social and demographic characteristics of our study (Table 1) were similar to those reported in prevalence studies in the international literature that used the RDC/TMD with large samples (N > 100), in both TMD patients and general populations, granting external validity to our results.[30] In our study, the ratio of men to women was 2:1, and the majority of the patients were aged between 20 and 49 years. These results are similar to those reported in the literature, where the men-to-women ratio ranges from 2:1 to 5:1 and the average age ranges from 23 to 46 years. Our sample, similar to the samples reported in the literature, was predominantly single or married individuals with a high school education and an average income.[12,13,17,18,41–49] The number of patients considered (1,643) far exceeded any similar prevalence study using either RDC/TMD Axes I or II, both in the patient and in the general populations, and it was only outnumbered by a systematic review study on the prevalence of TMD.[21]

The prevalence of the RDC/TMD group classification in TMD patient populations, with respect to the right or left side or both, has varied among studies featuring

large populations (N > 100): *(a)* 13.6% to 50.2% for group Ia, *(b)* 1.9% to 30% for group Ib, *(c)* 22.0% to 43.3% for group IIa, *(d)* 5.8% to 12.8% for group IIb, *(e)* 1.9% to 8.1% for group IIc, *(f)* 13% to 33.2% for group IIIa, *(g)* 2% to 6.4% for group IIIb, and *(h)* 2.7% to 3.4% for group IIIc.[12,13,17,42,47,48,50,51] It must be emphasized that a single patient may have more than one diagnosis. In a systematic review, the only meta-analysis for RDC/TMD Axis I prevalence in patient populations was reported to be 45.3% for group I, 41.1% for group II, and 30.1% for group III.[21] These results are in agreement with two Brazilian studies that used the RDC/TMD classification in TMD populations, in which the researchers found prevalences of 77.1% to 82.8% for muscle disorders, 75.7% for disk displacements, and 61.4% for other joint disorders.[22,52] These data confirm that the RDC/TMD Axis I classification is reproducible worldwide with moderate agreement.[5–8,11] These results could not be compared to those obtained from our study because our study was community-based.

Studies in community populations using the RDC/TMD have shown that the RDC/TMD Axis I group prevalence for the right or left side ranges from 6% to 13.3% for muscle disorders (groups Ia or Ib), 8.9% to 15.8% for disk displacements (groups IIa, IIb, or IIc), and 4.0% to 12.5% for other joint disorders (groups IIIa, IIIb, or IIIc).[21] Again, a single patient may have more than one diagnosis. These figures are in agreement with those obtained in the present study for TMD group prevalence (Table 2). The combined RDC/TMD Axis I group prevalence (group I = Ia + Ib; group II = IIa + IIb + IIc; and group III = IIIa + IIIb + IIIc) in this study is similar (29.5% for group I, 7.9% for group II, and 39.1% for group III) to the prevalence found in three population studies that reported the overall combined TMD prevalence (groups I, II, and III), which ranged from 14% to 32.1%, with the exception of group II.[43,49,53] The observation of a lower prevalence for group II in this study may have occurred because joint sounds, even with calibrated examiners, usually only reach moderate agreement.[5–8,11] One figure that is exclusive to our study is the prevalence of disk displacement with reduction with pain (Table II), which showed approximately half the prevalence of disk displacement with reduction without pain. This information is important because it provides the actual prevalence of those patients with disk displacement with reduction who actually are in need of treatment.

Our chronic pain grade classification, that of RDC/TMD Axis II (CPG I to IV = 36.2%), is also in agreement with the numbers reported in the literature for combined RDC/TMD Axis I for muscle pain (group I) and/or arthralgia (group III) in community populations (14% and 32.1%, respectively), but it must be emphasized that only a few studies have reported all RDC/TMD Axis I diagnostic groups in community populations as well as the global Axis I TMD prevalence.[43,49,53] In addition, because these studies did not use the CPG (RDC/TMD Axis II classification), it is not known how many of the patients are in need of specialized treatment. In this investigation, we found that only 5.1% were in need of specialized treatment due to limitations caused by pain (CPG III to IV), regardless of whether the pain comes from the muscle, the joint, or both. This number may increase to 17.8% if we consider patients with limitations due to pain as well as with those with high-intensity pain (CPG II to IV). Our results are in line with those of a systematic review of TMD treatment need prevalence in adults, which was estimated to be between 15.6% and 16.2% (CI = 10.0% to 23.6%). However, it is important to note that treatment need is dependent on the criteria used (ie, severity of signs and symptoms), considering that the prevalence of treatment need based on clinical TMD signs is higher than that based on subject-reported symptoms.[54] In addition, the need for treatment may also depend on person-related characteristics, such as the importance given by the patient to the problem and access to treatment.[55]

Therefore, prevalence studies that have used the RDC/TMD examination and diagnostic guidelines, both in TMD populations and community populations, usually reach similar numbers regardless of country of origin, and the variation observed is usually due to interexaminer reliability. However, this variability might be minimized by calibration and recalibration in future investigations.[8,11] In addition, similar to what has been reported in the literature, in this study TMD symptoms are more prevalent than signs, and some individual signs and symptoms are more prevalent than the RDC/TMD diagnostic group classifications (groups I, II, and III).[2,21] These trends might be observed because isolated TMD signs and symptoms are common in the general population, even in non-TMD patients, and they cannot be used as measures of TMD prevalence; only the RDC/TMD diagnostic group classification in community population studies can be used for that purpose.[2,3,12,21]

Among the previous Brazilian studies that conducted surveys in the general population regarding the prevalence of chronic pain, none of them used the RDC/TMD. The population surveys performed were studying orofacial pain in general, which included headaches, idiopathic orofacial pain, toothaches, trigeminal neuralgia, burning mouth syndrome, and fibromyalgia.[23–25,27] Focused specifically on TMD signs and symptoms, only one survey reported that 39.2% of patients had at least one symptom and 25.6% reported TMD pain.[28] Between the two studies that

indeed used the RDC/TMD, one used only Axis I and the other used both Axes I and II.[22,52] However these two studies were performed among TMD patient populations and not among community populations. The present investigation cannot be compared with previous Brazilian studies because it was the only one that used both RDC/TMD Axes I and II among the general population and reported the RDC/TMD diagnostic group classification.

In the present study, two comorbid and related conditions usually seen in TMD patients, such as sleep/awake bruxism and migraines/headaches, were found to be present. Regarding sleep/awake bruxism, a moderate to high prevalence (Table 4) was found in the population; however, the prevalence recorded was substantially higher (30% and 33.4%, respectively) than that reported in the literature in population studies using both standard questionnaires and polysomnography (5.5% to 12.5%).[27,56] This overestimation most likely occurred because the RDC/TMD only asks one question related to sleep bruxism and another related to awake bruxism, which does not follow the recent definition of sleep bruxism.[27,56] This finding is in agreement with the recent literature, which indicates that sleep bruxism is a risk factor for the development of TMD as determined using questionnaires; however, this association was not confirmed when polysomnography or portable EMG appliances were used.[39,57] Therefore, sleep bruxism and TMD should be considered parallel or comorbid unrelated events, but more studies should be performed in this regard.[58]

Regarding the association between headaches, facial pain, and sleep bruxism, our results (Table 4) also revealed a high prevalence (67.9%) of combined headaches and/or facial pain, as in other Brazilian studies (55.5% to 58.1%).[23,25,27] Similar to the case of sleep/awake bruxism, the RDC/TMD is not the gold standard questionnaire for the assessment of headaches, which might have contributed to the high prevalence found.[24–27] Correlations between sleep bruxism and headaches and between headaches and TMD have been reported; however, a cause-and-effect relationship could not be established.[24–27,39,40] Another recent study based on validated questionnaires for TMD, headaches, and sleep bruxism found that the combination of sleep bruxism and TMD is a risk factor for the development of chronic migraine.[26] A recent neurophysiological study demonstrated that patients with localized TMD pain differed in allelic frequency of single nucleotide polymorphisms (SNPs) that mapped to a serotonergic receptor pathway, whereas cases of TMD with widespread pain differed in the allelic frequency of SNPs that mapped to a T-cell receptor pathway, showing that generalized chronic pains may have a genetic predisposition.[59] Indeed, one study demonstrated that chronic nonresponding TMD pain is more similar in terms of memory and reaction time tests and sleep and depression levels, to another chronic pain condition—irritable bowel syndrome—than to responding TMD patients.[41]

In the present investigation, traumatic injury to the face or jaw was reported by less than 5% of the population, and less than half of that population could attribute the pain to the injury. Our prevalence rate is in agreement with that reported in the literature, which indicates that whiplash injuries in adults and fractures against the condyle in children and adolescents are the most prevalent injuries against the jaw (2.4% to 8%). Whiplash injuries usually increase the incidence of TMD pain and have worse prognoses than nonwhiplash TMD pain; on the other hand, mandibular fractures in particular, before the age of 12, induce little impairment in jaw functioning and require no surgical intervention.[60,61] However, if the trauma is to the head, a neuropathic pain condition as a result of a closed head injury might arise, which might lead to neuropsychological deficits and difficult posttraumatic TMD pain management.[62]

Conclusions

The results of this study allowed the authors to conclude that the prevalence of TMD measured by RDC/TMD Axis I and II in a Brazilian population in the city of Maringá in southern Brazil is comparable to that indicated by similar population studies performed in other countries. However, the prevalence of patients in need of treatment in all TMD diagnostic groups is lower than what has been reported. In addition, TMD is usually more prevalent in young adults, middle-income patients with post-secondary education, and women, and it presents a medium intensity level and low disability rate.

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Literature Abstract

The Incidence of Complications Associated with Lip and/or Tongue Piercings: A Systematic Review

Piercing of the oral structures (lips, tongue, cheeks, uvula) can be associated with complications like abnormal tooth wear, chipping, cracking, and gingival recession. This review systematically assessed the literature to investigate the risk associated with oral/perioral piercings. Reviewers screened literature for information relating to the incidence of gingival recession/tooth injuries determined by a dental care professional in lip and tongue piercings. Fifteen papers were selected and assessed. Results showed a significant relative risk ratio for gingival recession associated with lip piercing at 4.14 times that of the control group, and with tongue piercings at 2.77 times. Relative risk ratio for tooth injuries (chipped/cracked/broken teeth, tooth wear, fractures) associated with tongue piercings was 2.44 times that of the control group, and with lip piercings 1.33 times. Although this review had its limitations, it can be concluded that lip and tongue piercings are highly associated with the risk of gingival recession, especially in the regions that are in direct contact with the stud closure. Tongue piercings are significantly related to the risk of tooth injuries. Practically, dental professionals may use this information for patient education and to detect complications in patients with such oral piercings.

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